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THE TABANIDÆ OF WESTERN UNITED STATES AND CANADA.*

JAMES S. HINE.

This paper although incomplete in many respects is offered as an aid for determining the Tabanidæ of the part of the country not so thoroughly covered by Osten Sacken's most valuable Prodrôme. I have spent much time and study on an extensive collection of Tabanids from the region, and although I have not satisfied myself in all particulars, some definite conclusions have been reached which are offered with the desire that they may be of service to future students.

In this work I have been aided in various ways and without this help I realize that it would not have been possible to do much that has been done. It is with the greatest pleasure therefore, that I make the following acknowledgements: The U. S. National Museum has loaned me all their undetermined material and Mr. Coquillett has aided me materially besides; Dr. Snow of Kansas University has loaned me much undetermined material, as well as the material he and his associates have collected on several of his numerous collecting trips in the West; Prof. R. C. Osburn has donated several hundred specimens he collected in British Columbia during two summers spent at the Minnesota Seaside Station; Prof. R. V. Harvey of the Queen's School, Vancouver has sent me a large quantity of excellent material from his region; the University of Illinois through Dr. Forbes and Prof. Hart have sent me material for study and Prof. Chas. W. Johnson of the Boston Society of Natural History, besides sending me much material for study has aided me in other ways. Dr. James Fletcher and Profs. E. D. Ball, V. L. Kellogg, R. A. Cooley and M. J. Elrod have each furnished valuable material. From this variety of sources and from other collectors I shall mention

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later it has been possible to get together a large and representative collection from the region covered by this paper. Through correspondence with Miss Gertrude Ricardo who has studied Bigot's types and also the Tabanidæ of the British Museum I have gained much. She has even redescribed several of Bigot's types for me and by this means I have satisfactorily identified a number of his species.

The European material I have for comparison consists of a large number of species acquired by exchange with Prof. Morio Bezzi of Italy, Dr. K. Kertesz of the Hungarian National Museum and E. Brunetti of England. In comparing one is convinced, with Dr. Loew, that hardly any of the species of the two countries seem to be exactly the same but in some cases they are very close.

Since I have been studying this family I have visited The Museum of Comparative Zoology, The U. S. National Museum and The Museums of Kansas University and The University of Illinois. At each place I was given every opportunity to study the contained material and am under obligations for these privileges.

In most cases under each species only those characters of most consequence in determination are mentioned.

Key to the North American Genera.

- | | |
|---|--------------------|
| 1. Hind tibiæ with spurs at the tip | 2 |
| Hind tibiæ without spurs | 6 |
| 2. Third segment of the antenna composed of eight annuli the first of which is only a little longer than the following ones | 3 |
| Third segment of the antenna composed of only five annuli the first of which is much longer than the following ones; ocelli present | 5 |
| 3. Front of female narrow; ocelli present or absent; fourth posterior cell at least open | <i>Pangonia</i> * |
| Front of female broad with a denuded callus; ocelli present | 4 |
| 4. Eyes in the female acutely angulated above; wing in both sexes with a dark picture | <i>Goniops</i> |
| Eyes in the female not acutely angulated above; wings hyaline | <i>Apatolestes</i> |
| 5. Second segment of the antenna about half as long as the first; eyes in life with numerous small dots | <i>Silvius</i> |
| Second segment of the antenna as long or but little shorter than the first; wing with a dark picture | <i>Chrysops</i> |
| 6. Third segment of the antenna with a well developed basal process | <i>Tabanus</i> † |
| Third segment of the antenna without, or with a rudimentary basal process | 7 |
| 7. All the tibiæ enlarged, the hind pair ciliate | <i>Snowiellus</i> |
| None of the tibiæ enlarged and the hind pair not ciliate | 8 |
| 8. Front of the female as broad as long the callus transverse | <i>Hæmatopota</i> |
| Front of the female narrow | <i>Diachlorus</i> |

* Including Diatomineura and Corizoneura.

† Including Atylotus and Therioplectes.

CHRYSOPS Meigen.

The species of this genus have fairly good characters. We have recognized the males of a number of the western species, but there are still several unknown. Twenty species are recognized in the following pages, one described as new. I offer the following key as an aid in separating them:

1. Apex of the wing beyond the cross-band hyaline 2
Apex of the wing beyond the cross-band not entirely hyaline 4
2. Abdomen yellow on the sides of at least the first two segments
Abdomen uniformly black *excitans* 3
3. Base of the fifth posterior cell hyaline *carbonarius*
Base of the fifth posterior cell not hyaline *mitis*
4. Second antennal segment decidedly longer than the third *ceras*
Second antennal segment not longer than the third 5
5. First antennal segment distinctly enlarged 6
First antennal segment not enlarged 10
6. First and second antennal segments distinctly enlarged *virgulus*
Second antennal segment not distinctly enlarged 7
7. Hyaline triangle separated from the posterior margin of the wing by an infuscated space *fulvaster*
Hyaline triangle reaches the posterior border of the wing 8
8. Facial and frontal callosities almost entirely black or brown *facialis*
Facial and frontal callosities yellow or the latter margined with brown 9
9. Slender species, male with base of anal cell hyaline, female with two small black spots on the middle of the second abdominal segment *pachycera*
Robust species, male with base of the anal cell infuscated, female usually with a geminate black spot on the second abdominal segment *coquilletti*
10. A hyaline spot in the discal cell *discahis*
No hyaline spot in the discal cell 11
11. Whole face black in ground color 12
Part or whole of face yellow 14
12. Abdomen yellow on the sides *frigidus*
Abdomen black 13
13. Apical spot separated from the cross-band *noctifer*
Apical spot united with the cross-band *nigripes*
14. Abdomen with longitudinal black stripes 15
Black abdominal markings not in the form of stripes 16
15. Four black stripes running the whole length of the abdomen *sequax*
Two black stripes running the whole length of the abdomen, the two lateral stripes abbreviated *pikiei*
16. Frontal callosity yellow with narrow brown border *coloradensis*
Frontal callosity black 17
17. Cheeks entirely yellow *furcatus*
Cheeks with a black band from the eyes to the margin of the mouth 18
18. Yellow on each side of the second segment not enclosing any black, apex of the second basal cell hyaline for its entire width *lupus*
Yellow on each side of the second abdominal segment enclosing a small black dot, hyaline at the apex of the second basal cell crossed by brown 19

19. The facial callosity on either side inside of the suture yellow, making the yellow stripe on the middle of the face appear wide
 The facial callosities on either side entirely black, making the yellow stripe on the middle of the face appear narrow
- proclivis*
surdus

Chrysops carbonarius Walker. The synonymy given in the list has been worked out mainly by Osten Sacken and Miss Ricardo. The species has a wide distribution and the uniformly black abdomen, light colored hairs on the sides of the thorax and hyaline spot at the base of the fifth posterior cell of the wing, serve to separate both sexes from related species.

Chrysops ceras Townsend. The near relatives of this species are to be found in Mexico. Townsend pointed out the differences separating *ceras* from *tanyceras* O. S. and *megaceras* Bell. when he described it. I have not the proper material to offer any suggestions upon what Townsend published. The peculiar structure of the antennæ referred to in the key separates it from all described species of the United States and Canada. The whole body is brown with dark posterior margins to the abdominal segments. The dark color of the wings is confined to the costal margin and distal half; the cross-band includes dark coloration in the region of the stigma, at the bases of the first submarginal and first posterior cells, and conspicuous margins to the cross-veins and their intersections with the longitudinal veins. The apical spot is separated from the cross-band, and is mostly confined to the apexes of the marginal and first submarginal cells, although a trace extends into the second submarginal. The furcation of the third vein is prominently margined with dark brown.

Chrysops coloradensis Bigot. The cheeks are yellow with the exception of a small brown spot near the eye, the frontal callosity is yellow with a narrow brown margin, the general color of the body is lighter than in *proclivis*, there are usually two spots on the second abdominal segment instead of a single geminate one; also the black on the third and fourth abdominal segments is somewhat reduced in extent and exists in the form of spots.

Chrysops coquillettii n. sp. Female 9 millimeters, some specimens slightly smaller. Facial and frontal callosities yellow, the latter with a dark margin, anterior part of cheeks a median line on face, and front exclusive of callosity, covered with bright yellow pollen and grayish hairs; palpi yellow, antenna, first segment distinctly swollen, first two segments brown with black hairs, third segment much longer than the second; basal annulus dark brown, remainder black. Thorax with the usual stripes which are somewhat obscured by thick grayish hairs; legs yellow with black at the joints and on apical part of anterior tibiae, all of anterior tarsi and last three or four segments of other tarsi. Wing with costal margin and cross-band black, apical spot fills out the

marginal, with the exception that there may be a trace of hyaline across the second vein, the broad apex of first submarginal, and reaches into the second submarginal. The cross-band occupies about half of the first submarginal, first, third and fifth posterior, one-fourth of second posterior, all of discal and fourth posterior and small apical parts of anal, and first and second basal; one-half or more of second basal, all of axillary and anal, except apex of latter are hyaline. Abdomen black and yellow, black as follows: first segment beneath the scutellum, second with two triangular spots united on anterior margin of the segment, but not reaching posterior, third and fourth segments each with four spots longitudinally separated by yellow, fifth and following segments except posterior margins. In some cases the fifth segment is colored like the previous one. Venter with a rather wide median stripe and a narrow lateral one.

Male, 8 millimeters, some specimens slightly smaller and some slightly larger. Head and its parts differing from those of the female only in sexual characteristics. Thorax not showing stripes as plainly, but otherwise this and the legs are as in the other sex. Wings with a spot in each basal cell equal to about one-fourth the length of its respective cell, and a fuscous patch in the base of the anal cell, otherwise like wings of the female. Abdomen, first segment black with the exception of a small yellow area on each external lateral margin, second segment yellow on sides and on posterior margin, the black is extended and reaches the anterior margin, but posteriorly is divided by anterior projections from the yellow posterior margin, so that it may be said to send backward four projections, the narrow lateral ones of which may be cut off by yellow and exist as separate spots, the third and fourth segments are like the second, but the lateral black spurs are not cut off, the fifth segment suggests the one before it, but the yellow is more or less obscure, excepting a narrow posterior margin, sixth segment black. Venter as in female.

A number of specimens from different collectors, taken in southern California. The species is named for D. W. Coquillett, who has produced a large number of valuable contributions to Dipterological literature and to entomology in general, and who collected several of the specimens near Los Angeles.

The species is nearest related to *pachycera*, but its larger size, different abdominal markings and a more extended coloration on the basal part of the second basal and anal cells are distinctive in both sexes.

Chrysops discallis Williston. This distinct species has somewhat the appearance of *fulvaster*, but does not have the enlarged first antennal segment. It is rather large in size and may be known by the prominent hyaline space in the discal cell of the wing.

The male which hitherto has not been described, is much darker than the female; the antennæ, proboscis and four small spots on the face are black; the facial callosities are shining yellowish, otherwise, the face is covered with gray pollen. Thorax dark with gray hairs and well marked gray stripes above; legs mostly black with the exception of the middle and hind tibiæ, which are largely yellow. Wings black with various sized hyaline spots in all the cells except the costal, marginal and fifth posterior; axillary cell almost altogether hyaline. Abdomen black with narrow lateral margins and rather wide posterior margins of the segments gray. On the second to the fifth segments the posterior border sends forward three extensions besides the lateral margins. Venter of the abdomen gray with three rows of black spots. Length, 10 millimeters.

Two males, one from Utah and the other from Montana. The latter sent in by Prof. R. A. Cooley, who has also contributed other material of interest from that State.

Chrysops excitans Walker. So far as western species of Chrysops are concerned this one is readily separated from all others by the absence of an apical spot on the wing and the bi-colored abdomen. The second basal cell infuscated on more than basal half separates it from sordidus of the eastern states.

Chrysops facialis Townsend. Female: Antennæ blackish above, yellowish beneath on first two segments; first segment distinctly enlarged but not so large as in some related species. Facial callosities shining black or dark brown, remainder of face yellow. Frontal callosity shining black, yellowish on disk. Ocellar area large, black, nearly reaching the eye on either side. Thorax black with yellow stripe on each side above the root of the wing; clothed everywhere with rather long yellow hairs. Legs yellow with joints, apical half or more of anterior tibiæ, and all the tarsi except metatarsi blackish; wings with costal margin and cross-band black. The hyaline triangle crosses the second vein contributing a small spot to the marginal cell, the apical spot fills out the apexes of the marginal and first submarginal cells and extends into the second submarginal; otherwise the apex of the wing beyond a line from outer end of the stigma to distal end of vein separating third and fourth posterior cells is hyaline. Also apical half of first basal, two-thirds of second basal, all of the anal except apical narrowed part, and all of axillary are hyaline. The distal half of fifth posterior cell is infuscated, but not so strongly as the basal half. Abdomen black and yellow, black as follows: Large spot beneath the scutellum, two spots united at base on middle of second and third segments, four spots united basally on fourth and fifth segments, and all of remaining segments except narrow posterior margins. Ventrally a wide stripe on

middle, a row of narrow spots on each side, and apical segments black, remainder yellow.

Male: Colored like the female except more black on legs and wings. In the latter the apical triangle is the same in both sexes, but in each basal cell there is only a small hyaline spot, and the hyaline in the anal cell is much reduced. Length of both sexes 8 millimeters.

A male and female in the Bolter Collection at the University of Illinois, and through the kindness of Dr. Forbes and Prof. Hart, I have been permitted to study them. Taken at Las Vegas, New Mexico.

Separated from related species by the black frontal callosity of the female and the black facial callosities of both sexes.

Chrysops frigidus Osten Sacken. Variable in size and coloration of the abdomen. Some of the western specimens are considerably larger than the average eastern specimens. The prominent apical spot united with the cross-band, together with the prominent yellow on the sides of the abdomen and the black ground color of the middle of the face, makes this species one of the easiest to recognize.

Chrysops fulvaster Osten Sacken. The first antennal segment is distinctly swollen. The dark of the wings is brownish and there is often a hyaline spot in distal cell of the wing of the female, but I have not observed it in the male. The wings are brownish along the whole posterior margin and the hyaline triangle is represented by a crescent-shaped sub-hyaline space in both sexes. A most abundant species over a number of western states.

Chrysops furcatus Walker. This species was placed as a synonym of *striatus* by Osten Sacken, but Miss Ricardo who recently studied the type in the British Museum, states that it is not identical with *striatus* and then points out differences. Previous to the past summer I had not recognized the species, but it was included among a number of specimens received from Mr. Jos. C. Ouellet of Montreal. Two specimens which agree with Walker's description and Miss Gertrude Ricardo's additional remarks, were taken at Val Morin a few miles north of Montreal. The wing is colored like that of *coloradensis*, the frontal callosity is pure black, and the face and cheeks are yellow with the exception of a black indented spot immediately below each facial callosity. The black spot on the second abdominal segment is deeply emarginate posteriorly and black on the third and fourth segments is in the form of four black spots on each, remaining segments black with a yellow hind border. The species is separated from *lupus* and *proclivis* by the wholly yellow cheeks. It does not come within the scope of this paper rightly, but since it has not been

fully considered heretofore in connection with species most like it it is included.

Chrysops lupus Whitney. Resembles *proclivis*, *furcatus* and *coloradensis*. The frontal callosity, the facial callosities outside of the sutures and a band on each cheek are black. Abdomen, black, arranged almost as in *proclivis* except there is no small black dot on either side of the second segment and the third and fourth segments have the black more distinctly in the form of spots necessitating more yellow and consequently making the whole abdomen appear lighter in general coloration. The type was collected in Colorado and specimens are before me from Laggan, Alberta, collected by Professor R. C. Osburn.

Chrysops mitis Osten Sacken. Much like *carbonarius*. In fact there is some doubt whether or not it should be considered as distinct from that species. The absence of a hyaline spot at the base of the fifth posterior cell and the somewhat larger size separate *mitis* from its near relative.

Chrysops nigripes Zetterstedt. Loew first reported this species from Alaska and Coquillett recognized a specimen taken by Kincaid of the Harriman expedition. This latter specimen is the only one that I have seen, for it appears to be difficult to get even European examples. The union of the apical spot and cross-band seems to be the best means of separating it from *noctifer* its nearest American relative.

Chrysops noctifer Osten Sacken. I have seen the types of both Osten Sacken and Williston and cannot see how it is possible to recognize the two species *noctifer* and *pertinax*. The difference in the two descriptions is mainly found in the presence or absence of reddish on the sides of the first two abdominal segments, and this appears to be too variable to be of specific value. I believe the two names are synonymous, and as *noctifer* is the older, it must be retained for the species. The prevailing black color of the whole body, and the apical spot separated from the cross-band are characteristics.

Chrysops pachycera Willison. Dr. Williston's types, a fine series of specimens from Dr. F. H. Snow and collected by him and his associates in Arizona and other specimens collected in Lower California have given me the opportunity for studying this species.

The first antennal segment is swollen, the third segment is much longer than the second, the facial and frontal callosities are yellow. In both sexes the anal cell is hyaline at base and the yellow on the sides of the first four abdominal segments is more extended than in related species.

Chrysops pikei Whitney. This recently described species has affinities with *sequax* and *univittatus*. The first basal cell is infuscated with the exception of a small elongate hyaline spot

contiguous with the hyaline base of the discal cell, the second basal cell is hyaline with the exception of a slight infuscation at base. The outer border of the cross-band is nearly straight, the hyaline triangle is rather small and does not cross the second vein and the apical spot fills out the marginal cell and much of the first and second submarginal and first posterior cells. The abdomen is yellow with two black stripes extending from the scutellum to the apex and on either side of these another narrower stripe of the same color extending backward from the anterior part of the third segment. The type was collected in Missouri and I have specimens from Kansas.

Chrysops proclivis Osten Sacken. Frontal callosity, antennæ, each facial callosity outside of the suture and cheeks black. First basal cell of the wing black for its entire length in the middle but near the apex on either side next the longitudinal veins there is some hyaline, the second basal is hyaline, the outer margin of the crossband is curved, the hyaline triangle is rather large and its apex crosses the second vein, and the apical spot is rather large occupying the apical part of the marginal and the first and second submarginal cells. Abdomen with a black spot beneath the scutellum widest before and connected with a black spot of the second segment. The black of the second segment is slightly emarginate behind and all but attains the posterior margin, and the broad yellow sides of this segment each inclose a small black dot. The remaining segments are black with a narrow serrate yellow posterior border, or there may be more or less separation of the black to form spots as in some of the related species.

The male is much darker than the female. The thorax is black with gray stripes, the wing is black with a small spot at the apex of each basal cell, a suggestion of a hyaline spot on the middle of the discal cell, and a hyaline triangle in all respects like that in the female. Parts of the fifth posterior, anal, and axillary cells are not so dark as the remainder of the wings. The abdomen is black with gray posterior borders to the segment, and three rows of faint triangles. The venter is yellowish with a broad black stripe in the middle and less plainly marked narrow spots on each side.

Adams has stated that the male of this species was described with some doubt by Williston, as the male of his *pachycera*.

Chrysops sequax Williston. The species has somewhat the aspect of *univittatus* and *striatus*. Separated from the latter by the hyaline triangle reaching or slightly transcending the second longitudinal vein, and the apical spot entering the first posterior cell. From the former by having four longitudinal black stripes on the abdomen instead of two.

Chrysops surdus Osten Sacken. Somewhat like proclivis but smaller. The facial callosities are black on both sides of the suture leaving a narrow yellow stripe on the middle of the face. The male is darker than the female and much like the male of proclivis in general appearance. However, the same characters which separate the females may be used in regard to the males.

Chrysops virgulatus Bellardi. Although this species has not been taken in the United States so far as I know, it seems best to include it in treating our species with the first antennal segment enlarged. Female 6 to 9 millimeters. First two antennal segments decidedly swollen, shining brownish, darkest above; third segment with basal annulus decidedly yellow, remainder black, slightly longer than the second, but not so long as the third. Ocellar area black, widely separated from the eye on either side; legs yellow with the exception of the knees, apical part of front tibiae and their tarsi and distal parts of other tarsi black or brown. Wings with costal margin and cross-bands black, apical spot rather wide, entirely filling out the marginal cell, the apex of first submarginal and extending into the second submarginal. The cross-band includes more than half of the first submarginal cell and about half of the first posterior, not quite half of the second posterior, and more than half of the third posterior, all of the fourth posterior and discal, basal half or more of fifth posterior and apexes of anal and first and second basal cells; basal two-thirds of first basal and one-third of second basal also black; a whitish area invades the hyaline areas on the outer and inner margins of the cross-band. Abdomen black and yellow, black as follows: An oblong patch beneath the scutellum, two or four usually connected spots on anterior part of second segment, and four oblong spots on each of the remaining segments separated longitudinally by yellow. The black on all the segments may be connected anteriorly and the last two segments may be altogether black. Venter yellow with a wide median black stripe and a narrower one on each side.

The male is decidedly darker than the female, the hyaline triangle of the wings is the same in both sexes, but the hyaline in the basal and anal cells consists of a spot in each, and taken together form a crescent, the spot in the anal cell being located nearer the wing base; the whole axillary cell is smoky.

Distinguished from related species by the short third antennal segment and the bright yellow basal annulus of the same. Several males and females taken at Guadalajara, Mexico, by Jesse McClendon in June and July, 1903. The synonymy is by Williston and I believe it should be adopted.

PANGONIA Latreille.

Following previous American authors I have not used all the generic names used by some European authors, but have considered the species as all belonging to Pangonia. By some our two species with the eyes naked and the first posterior cell closed would be considered under Pangonia; those with the eyes naked and the first posterior cell open under Corizoneura; while those with the eyes pilose and the first posterior cell open would come under Diatomineura. Our species of this group do not seem to appear in numbers like various species of Tabanus, consequently good series are not often met with in collections. There are seven western species considered in this paper and these may be separated as follows:

- | | |
|---|-------------------|
| 1. First posterior cell closed | 2 |
| First posterior cell open | 3 |
| 2. Legs uniformly dark brown | <i>saussurei</i> |
| Legs yellow | <i>incisa</i> |
| 3. Eyes hairy | 4 |
| Eyes naked | 5 |
| 4. Antennæ black; body uniformly blackish gray | <i>hera</i> |
| Antennæ yellow with apex black; body banded with black and yellow | <i>dives</i> |
| 5. Whole body including the antennæ pale yellowish | <i>ruficornis</i> |
| Body largely black | 6 |
| 6. Whole antennæ black, second abdominal segment yellow on the sides | <i>fera</i> |
| Third segment of antennæ yellow, second abdominal segment not yellow on the sides | <i>velutina</i> |

Pangonia dives Williston. The eyes are pilose, the antennæ are yellow with black at the apex of the third segment; legs reddish with apex of tibiæ and tarsal segments more or less fuscous wings hyaline with costal border dilute yellowish, anterior branch of the third vein with a stump at the base; abdomen with the anterior part of each segment black, posterior part yellow. The yellow often predominates on the first three segments while I have not observed any variation of the remaining segments. Length about 15 millimeters.

It appears that *Diatomineura californica* Bigot is a synonym.

Pangonia fera Williston. The antennæ and legs in both sexes are black, and the abdomen is black with red on the sides of the second and often the third segments, and in the female especially the posterior border of each segment is fringed with yellow hairs; the eyes are naked and the wings are nearly hyaline with brown veins and stigma and dilute yellowish costal margin; ocelli present, thorax black with black pile. Length 12 to 18 millimeters.

Pangonia hera Osten Sacken. I have only seen the type of this species. Osten Sacken characterizes it as follows: "Proboscis short, hardly projecting beyond the palpi; body uniformly

blackish-gray; wings grayish brown; eyes pubescent, first posterior cell open. Length 13 to 14 millimeters. The type locality is San Francisco, California.

Pangonia incisa Wiedemann. First posterior cell closed, legs and antennæ yellow, ocelli present, proboscis slender longer than the height of the head; wings uniformly yellowish; thorax dark in ground color and clothed with yellow pile. In the female the abdomen is black on the anterior part of each segment, and narrowly yellowish posteriorly; posterior margin also fringed with yellow hairs. In the male the abdomen is yellow with black beneath the scutellum, and a triangular black marking on the middle of the anterior half of the second segment. Length 14 to 17 millimeters. Specimens of both sexes are at hand from Oklahoma, received from Professor E. E. Bogue.

Pangonia ruficornis Bigot. What appears to be this species was received from Professor V. L. Kellogg, taken at Palo Alto, California, July 27. Eyes naked, ocelli present; face, front, antennæ and palpi yellow; proboscis brownish, thickened, scarcely longer than the slender palpi; thorax reddish yellow, legs concolorous with the thorax, wings with a yellowish tinge, more pronounced on the costal margin; anterior branch of the third vein with a stump at base. Abdomen yellow. Has the appearance of being a very distinct species. Length 12 millimeters.

Pangonia saussurei Bellardi. I have a single male specimen that I have identified from Bellardi's description and figure as this species. The specimen was taken in the Huachucas Mountains of southern Arizona by Dr. R. E. Kunze. The antennæ are yellow, third segment slender, quite prominent at the base, proboscis longer than the height of the head, palpi short and slender, eyes naked, ocelli present. Thorax brown, clothed with gray pollen and brown and gray pubescence; legs brown, anterior and middle tibiæ and tarsi a shade lighter than their femora; wings dilute yellowish hyaline, with yellowish more distinct along the costa and margins of some of the veins; a long stump at the base of the anterior branch of the third vein; first posterior and anal cells closed. Abdomen in general grayish, with the anterior margin of each segment brownish; posterior margin of each segment with white hairs, remainder of segments clothed with black hairs. Length 18 millimeters.

Very distinct from the other species of the genus from our fauna, but with some affinities with *incisa*.

Pangonia velutina Bigot. I have not seen this species. Some characters which Bigot gives are as follows: antennæ yellow with first two segments black, eyes naked, first posterior cell of wing open, abdomen black, second segment with a large yellowish spot on the middle of the posterior border. Length 11 millimeters. The type is from California.

SILVIUS Meigen.

Members of this genus are widely distributed, being found on nearly all the large land areas of the globe. Our three species are western, none of them having been taken on the Atlantic coast, but *quadrivittatus* has been collected several times on the gulf coast of Texas. In North America the genus is divided into two distinct groups, *gigantulus* belonging to one and the remaining species to the other. The following key is offered as an aid in separating them:

1. Wings hyaline, without spots, yellowish along the costa; whole body yellowish *gigantulus*
- Wings hyaline, usually spotted; whole body gray pollinose 2
2. Abdomen above with four longitudinal rows of spots *quadrivittatus*
- Abdomen above with two longitudinal rows of spots or none *pollinosus*

Silvius gigantulus Loew. Length 10 to 13 millimeters. Although this one is very distinct in coloration from the other American species of the genus the generic characters are the same in all. It has the appearance of *vituli* of Europe, the wings are uniformly colored, being hyaline with the exception of the costal border which is yellowish, the antennæ are yellowish with the third segment except the extreme base dark brown, two small spots on the face, a triangular frontal callosity and ocelli dark brown, remainder of the face and front, rear of the head, and thorax covered with yellow pollen and yellow pile. The abdomen is yellow with a dark spot beneath the scutellum and a spot of the same color on the anterior middle of the second segment and in some specimens there is an irregular middorsal black stripe running the whole length of the abdomen. The male is colored like the female.

Silvius pollinosus Williston. The specimens that fall in this and *quadrivittatus* are variable and it is usually a difficult matter to make satisfactory determinations. The character which I have given in the key above, namely: the arrangement of the dark coloration on the abdomen may be used but even this is variable. In this one the color may be in two series, or these two series may be united to form a middorsal rather wide band, or lacking altogether. In some specimens the abdomen is yellow on the sides and in others not. The wings usually have prominent black markings on the cross-veins and at the furcation of the third vein and the stigma is black. The male is colored like the other sex, and has as many variations, although it appears to be more often yellow on the sides of the abdomen. Length 8 to 11 millimeters. Type from western Kansas.

Silvius quadrivittatus Say. This species was placed in the genus *Chrysops* when its description was written by Say and was not recognized by Osten Sacken when he published his *Prodrome*,

and Williston made no comparison with it when he described *pollinosus*. However the latter author, in the Tenth Volume of Transactions of the Kansas Academy of Science, recognizes both species and says of *quadrivittatus*: "The species differs from *pollinosus* in being darker throughout, in the antennæ being more slender, in the dorsum of the thorax having gray stripes on a black ground, and in the four abdominal stripes being better marked." Type from "Near the Rocky Mountains." Male colored like the other sex. Length 7 to 10 millimeters.

APATOLESTES Williston.

Specimens belonging to this genus look some like members of the genus *Tabanus*, but have spurs at the apex of the posterior tibiæ, a character which places it in a different subfamily from that to which *Tabanus* belongs. The genus was described by Dr. Williston in 1885.

Apatolestes comastes Williston. In a long series of specimens of the species from California and Arizona, most of them collected by Coquillett, I find some variations. The size varies from 8 to 17 millimeters. Some specimens are quite black while others are gray from being covered with dense gray pollen and some of the males have reddish on the sides of the second and third abdominal segments. The first two segments of the antennæ are usually covered with gray pollen while the last segment is black and ocelli are prominent in both sexes. In the female the front is rather wide and, differing from many species of its subfamily, is narrowest at the vertex and gradually widens toward the face. There is some variation but in most specimens there is a narrow pollinose space just above the antennæ, after which the whole front is mostly shining black.

Apatolestes eiseni Townsend, from Lower California seems to be a synonym.

SNOWIELLUS n. gen.

Front rather wide, narrowest at the vertex and gradually widening toward the antennæ. Antennæ inserted beneath the middle of the eyes, proceeding from beneath the swollen subcallus, first segment normal on upper side but strongly produced downward, second segment small, third segment elongate somewhat enlarged at the base but with only an indication of a basal process. All the tibiæ enlarged and the hind pair distinctly ciliate outwardly. Anterior branch of the third vein without a stump at base, its distal end meeting the costa at the first third of the distance from where the second vein meets the costa to the apex of the wing.

Snowiellus atratus n. sp. General color black with the extreme apex of the wing hyaline. A gray pollinose patch beneath

the antennæ, otherwise the face including the cheeks, and the front below to above the frontal callosity denuded and shining black; above the frontal callosity and connected with it by a narrow interval is a nearly rectangular shining black spot, otherwise the front is covered with dark gray pollen. No ocelli. The third segment of the antenna appears slightly reddish caused it seems by a covering of grayish pollen, slightly enlarged at base but not with a distinct basal process, basal annulus as long or a little longer than the other four taken together; second segment small with a few black hairs at the anterior upper angle; first segment of normal form above but strongly produced below making it appear almost as though the second segment is attached to its side, furnished above and below with short black hairs; legs black, all of the tibiæ enlarged but not so much as in *Lepidoselaga lepidota*, hind pair with a dense row of cilia on the outer side. Wings black with the exception of apexes of the first and second submarginal cells which are clear hyaline. The line of union of this hyaline and the black forms a strong curve, and at no point is the hyaline wider than the fourth of the total length of the second submarginal cell. Abdomen uniform blue-black above and below. Length 13 millimeters.

A female taken in Oak Creek Canyon, Arizona, in August, 1904, by Dr. F. H. Snow for whom the genus is named.

The insect has affinities with both the genera *Selasoma* and *Bolbodimyia* but does not fall in either. It is an interesting species and a splendid addition to the known North American fauna.

HÆMATOPOTA Meigen.

A genus of nearly fifty species widely distributed in the Eastern Hemisphere but represented by only two species in the Americas. The peculiarly enlarged first antennal segment and the wide transverse front are characteristic.

Hæmatopota americana Osten Sacken. The two known American species are both found in the United States, but only this one is western. It is larger than *punctulata* of the eastern states, and in the specimens before me the third antennal segment, although somewhat compressed in both, is wider and shorter in *punctulata*. Osten Sacken states that *americana* is closely related to *pluvialis* of Europe and has published his results of a comparison of the two. There are only a few specimens of *punctulata* in collections so the opportunity for a careful comparison of our two species has not appeared.

TABANUS Linne.

Some authors have considered the species here included under this one genus as belonging to three genera. The species with

pilose eyes and ocelligerous tubercle are put in *Apatolestes*, those with pilose eyes and without the ocelligerous tubercle in *Atylotus* and the others with naked eyes and no ocelligerous tubercle form the genus *Tabanus*. A large number of the species from the region covered by this paper fall into *Apatolestes* and are the hardest to characterize so others can recognize them. They look much alike and it would seem sometimes that species are made on meager characters, but a study of European species of the genus convinces one that the older authors have done the same thing, and moreover when one studies our own forms he gradually comes to the same conclusion that the Europeans evidently have, that is, it is practically impossible to characterize a species at all when so many points are considered as only variations of the same.

It is my purpose that this paper supplement Osten Sacken's *Prodrome*, therefore some of the species that occur almost as far west as the Rocky Mountains may not be considered while some that are rightly eastern species are included because they are not treated by Osten Sacken.

The following key is offered as an aid for separating a most difficult group:

- | | |
|---|-------------------|
| 1. Eyes naked | 2 |
| Eyes pilose | 13 |
| 2. Large species, abdomen uniformly black or brown | 3 |
| Smaller species, abdomen bicolored | 6 |
| 3. Wings with a dark spot at the furcation of the third vein | 4 |
| Wing without dark coloration at the furcation of the third vein | 5 |
| 4. Thorax covered with white pollen or down | <i>punctifer</i> |
| Thorax brown with narrow white stripes | <i>benedictus</i> |
| 5. Wings black | <i>atratus</i> |
| Wings subhyaline | <i>agrotus</i> |
| 6. Wings with large brown patches | <i>venustus</i> |
| Wings hyaline | 7 |
| 7. Abdomen brown with white posterior margin to each segment | <i>annulatus</i> |
| Abdomen not so marked | 8 |
| 8. Abdomen with a uniform white stripe from the scutellum to the end of the abdomen | <i>lineola</i> |
| Abdominal markings not in the form of a uniform band | 9 |
| 9. Abdomen with a middorsal row of unconnected white triangles | 11 |
| Abdomen not so marked, small species, not more than 12 millimeters in length | 10 |
| 10. Abdomen gray, with four small black spots on each of segments two to six | <i>cribellum</i> |
| Abdomen with three irregular gray stripes composed of contiguous spots, base of anterior branch of the third vein with a long oblique stump | <i>productus</i> |
| Abdomen black with a very narrow white border to each segment, and on either side a row of very small white spots | <i>fratellus</i> |
| 11. General color of abdomen brown | <i>flavidus</i> |
| General color of abdomen black | 12 |

12. White triangle on the second abdominal segment of the same size as on the third and fourth segments. Length about 13 millimeters *coffeatus*
 White triangle on the second abdominal segment much smaller than those on the third and fourth segments. Length about 15 millimeters *hyalinipennis*
13. Palpi clear black, general color of the whole body black 14
 Palpi yellowish 15
14. Costal cell dark brown *procyon*
 Costal cell hyaline *sequax*
15. A single narrow transverse brown band across the eye, no ocelligerous tubercle *insuetus*
 No such band across the eye, ocelligerous tubercle usually present 16
16. Whole body shining black, if there are gray spots on the abdomen there is no red ground color beneath them. Ocelligerous tubercle denuded *osburni*
 Whole body not black, or if so the subcallus not denuded; sometimes black with red ground color beneath the gray abdominal spots 17
17. Each abdominal segment black with a wide irregular gray border, wings dilute brownish *zonalis*
 Abdomen not so marked, wings hyaline or nearly hyaline 18
18. Abdomen with a wide middorsal brown stripe and on either side of it a gray stripe of about equal width. *doager*
 Abdomen not so colored 19
19. Abdomen largely black with three rows of white spots, often with red ground color beneath the lateral spots 20
 Abdomen broadly red on the sides; this color not usually in the form of spots 30
20. Antennæ black, or at most with a trace of reddish at the base of the third segment 21
 Antennæ largely red 26
21. Wing with distinct fuscous on the margins of the cross-veins and on the furcation of the third vein. 22
 Wing with at most only a trace of fuscous on the margins of the cross-veins and furcation of the third vein 24
22. Subcallus not denuded in the female *illotus*
 Subcallus denuded in the female 23
23. Venter of the abdomen largely red *centron*
 Venter of the abdomen black, covered with gray pollen *rhombicus*
24. Wings reddish hyaline, lateral abdominal spots usually rounded *septentrionalis*
 Wings clear hyaline, lateral abdominal spots angular and oblique 25
25. Base of the anterior branch of the third vein with a stump *opacus*
 Base of the anterior branch of the third vein without a stump *itensivus*
26. Basal part of the third segment of the antenna fully as wide as long *laticornis*
 Basal part of the third segment of the antenna longer than wide 27
27. No red beneath the lateral gray abdominal spots *gilanus*
 With red beneath the lateral gray abdominal spots 28
28. Head distinctly wider than the thorax *laticeps*
 Head not noticeably widened 29
29. Base of the anterior branch of the third vein with a stump *frenchii*
 Base of the anterior branch of the third vein without a stump *susurrus*

- | | | |
|-----|--|-------------------|
| 30. | Antennæ black, or at most with a trace of red at the base of the third segment | 31 |
| | Antennæ largely red | 33 |
| 31. | Subcallus denuded | <i>centron</i> |
| | Subcallus not denuded | 32 |
| 32. | Wing with brown clouds on the cross-veins and the furcation of the third vein | <i>sonomensis</i> |
| | Wing with no clouds on the cross-veins and furcation of the third vein | <i>phanops</i> |
| 33. | Front of the female unusually wide above, distinctly narrowed anteriorly | <i>captivis</i> |
| | Front of the female not unusually wide, sides nearly parallel | 34 |
| 34. | Third antennal segment fully as broad as long | <i>laticornis</i> |
| | Third antennal segment longer than wide | 35 |
| 35. | Costal cell brown | 36 |
| | Costal cell hyaline | 37 |
| 36. | Palpi robust | <i>epistatus</i> |
| | Palpi slender | <i>affinis</i> |
| 37. | Head decidedly wider than the thorax | <i>laticeps</i> |
| | Head not noticeably widened | 38 |
| 38. | Base of the anterior branch of the third vein with a stump | <i>frenchii</i> |
| | Base of the anterior branch of the third vein not with a stump | <i>susurrus</i> |

Tabanus ægrotus Osten Sacken. Easily identified by Osten Sacken's description. It appears some like our eastern *atratus*, but the wings may be said to be subhyaline instead of black as in that species. Usually the whole body is black, but in some specimens the abdomen above has a median row of very small white triangles, one on the posterior border of each segment.

Tabanus affinis Kirby. There is some variation in the extent of red on the abdomen. This seems to occur in specimens from the same locality to the same extent as in specimens from different localities. Its size, fifteen to nineteen millimeters, makes its determination rather easy, as it is the largest of our species with pilose eyes. Some specimens of *affinis* and some of *sonomensis* are rather close together, but the third segment of the antennæ is narrower in *sonomensis* and the basal process less prominent. The palpi are very slender in *affinis*.

Tabanus annulatus Say. Rarely collected and probably there is not more than a dozen good specimens in the collections of the country. The front is narrow and the frontal callosity and what in other species is called the spindle shaped line, unite to form a very narrow raised line of nearly uniform width reaching nearly to the vertex, eyes naked, a small ocelligerous tubercle. Thorax uniform gray, abdomen brown with a gray posterior border to each segment; wings hyaline. Length 12 to 14 millimeters. Taken as far west as Kansas and Missouri. The species is one of the anomalies of its family.

Tabanus atratus Fabricius. Its large size and black color serve to separate this species from all others of the western region. Taken as far west as Colorado.

Tabanus benedictus Whitney. A large species related to *nigrescens* of the eastern states. The first posterior cell of the wing is closed or nearly closed. The front is rather narrow, narrowest anteriorly, the frontal callosity before almost as wide as the front, gradually narrowed, about twice as long as wide, and connected behind with a narrow line which extends to near the last third of the front. Abdomen dark brown, pruinose, resembling the abdomen of the common *atratus*. Length nearly 25 millimeters. Specimens from Louisiana. The types were taken in Missouri.

It is not properly a western species in the sense of this paper, but is included because it has been described only recently, and therefore is not mentioned in papers treating eastern species.

Tabanus captonis Marten. In his bibliography of North American Dipterology Dr. Williston has omitted Marten's paper entitled "New Tabanidæ" in the Canadian Entomologist XI, 210, and in his paper "Notes and Descriptions of North American Tabanidæ" published in Trans. Kan. Acad. of Sci. he did not mention the four species described therein, although he mentions all the species described in Marten's other paper. It would appear that the first paper was omitted through oversight. At any rate, I believe that Williston's *comastes* is synonymous with Marten's *captonis*. The species has somewhat the aspect of *affinis*, but the female is easily known by its very wide front, gradually narrowed anteriorly, and the denuded subcallus.

The male is like the female. The antennæ are red with the exception of the apical portion of the third segment which is more or less black. the frontal triangle is covered with silvery white pollen.

Tabanus centron Marten. As stated under *rhombicus* I consider this equivalent to Osten Sacken's second form of *rhombicus*. The subcallus is denuded, the antennæ are black with base of third segment red, and in some specimens the two basal segments are reddish with short black hairs. There is no stump at the base of the anterior branch of the third vein, and the wings are hyaline with costal cell yellowish and faint clouds on the margins of the cross-veins and furation of the third vein. In some specimens the abdomen is reddish on the sides of the first three or four segments. The male is colored like the female. Length 16 to 17 millimeters.

Tabanus coffeatus Macquart. A dark colored species measuring 12 to 13 millimeters in length. Taken in many of the eastern states and as far west as Colorado. Each abdominal segment is black with a white posterior border which expands into a prominent triangle on the middle of the dorsum. Very distinct from all western species but much like small specimens of *melanocerus* from the eastern states.

Tabanus cribellum Osten Sacken. I have seen Townsend's types of *guttatulus* in Kansas University collection, and have compared with Osten Sacken's figure of *cribellum*. It is my opinion that the two are synonyms and as the latter name is the older it would stand for the species.

The eyes are naked, the antennæ reddish with the annulate portion of the third segment black and about the length of the basal. Wings hyaline, abdomen gray with four brown markings on each segment. These markings may be united in varying ways. Length about 10 millimeters.

Specimens from Mesilla Park, N. M., taken by T. D. A. Cockrell. As I understand it, Osten Sacken's types were taken in northern Mexico, only a few miles from where Townsend procured his specimens.

Tabanus dodgei Whitney. There are two conspicuous white stripes on the thorax separated by a wider dark brown stripe, which in most specimens is divided for the anterior half of its length by a very narrow white line. Exterior to the white stripe on each side is a dark stripe followed by gray on the pleura. The abdomen is marked by a rather narrow dark brown stripe on the median line, followed by a gray stripe of about equal width on either side, and these followed by obscure brownish on the outer margins. First two segments of antennæ red, third black with basal prominence rounded. The male is colored like the female in all details. The head in both sexes is rather small and flattened so that the longitudinal diameter is shorter than in most other species of its size. Length 14 to 16 millimeters.

It is a very distinct species and cannot be confused with any others of our fauna. A number of specimens taken at Onaga, Kansas, by F. F. Crevecoeur, who has sent me much interesting material.

Tabanus epistatus Osten Sacken. This species averages much smaller than *affinis*, but small sized specimens of the latter are much like the larger ones of *epistatus*. A good character for separating the two species may be seen in the palpi. In *affinis* these are long and slender while in the latter they are robust. The antennæ are usually red with the annulate portion of the third segment black. However, there is some variation but in all the specimens I have studied the base of the third segment is invariably red. The subcallus is often denuded; length 13 to 17 millimeters.

The larger specimens, which I cannot separate from the others by any constant character, agree in detail with Marten's description of *californicus*. Therefore I am of the opinion that the latter should be considered a synonym.

Tabanus flavidus n. sp. Female: Length 12 to 14 millimeters. Eyes naked, antennæ red with annulate portion of the third seg-

ment black, second segment with a few black hairs above, basal portion of the third segment angulate above, widest at first third of its length and gradually narrowing to the beginning of the annulate portion; subcallus covered with gray pollen, front rather narrow, narrowest before; frontal callosity dark brown, occupying the whole width of the front, nearly square and connected above with a narrow line which reaches half way to the vertex; an indication of an ocelligerous tubercle. Usual parts of front covered with gray pollen. Face and cheeks covered with gray pollen, beard white, palpi yellowish with short white hairs. Proboscis shorter than the length of the head. Thorax fuscous with the usual gray stripe, sides and sternum covered with white hairs. Upper side of front femora, apex of each front tibiæ, front tarsi and last three or four segments of other tarsi fuscous, other parts of legs red. Wings hyaline, stigma and veins clear brown, anterior branch of the third vein with a stump. Abdomen light brown above with posterior borders of segments and mid dorsal row of triangles gray. On the sides of the segments and on the last three segments above there are indistinct fuscous areas, and in some specimens there are faint indications of lateral rows of small grayish spots. Venter red, darker, almost fuscous at apex.

Specimens collected by Dr. R. E. Kunze in southeastern Arizona and by C. H. T. Townsend in Chihuahua, Mexico; the latter the property of the U. S. National Museum. I have received specimens of this species labelled "*T. sodalis* Williston." *Tabanus sodalis* was described without locality but a study of the types convinces me that the name is synonymous with *T. trispilus* Wied. The specimen to which the name *sodalis* was originally given was taken in White Mountains, New Hampshire.

The reddish or brownish color is characteristic of *flavidus*.

***Tabanus fratellus* Williston.** Very easily known from its resemblance to *pumilus* of the eastern states. The whole body is dark colored, the abdominal segments have narrow gray posterior margins, and on each side of segments 1-6 is a similarly colored small round spot, which does not touch either margin. The basal part of the third antennal segment is narrower than in *pumilus*. Eyes naked. Length about 10 millimeters.

I have received specimens of this species from Miss Ricardo who studied Bigot's type, with the statement that they are identical with the type of Bigot's *Diachlorus* (?) *hæmatopotides*. The latter name is therefore a synonym of *T. fratellus*.

***Tabanus frenchii* Marten.** I have before me several specimens which agree with Marten's description. This species with *tetricus* and *susurus* are described as having three rows of gray triangles on the abdomen and red antennæ with apical part of third segment black, which is a combination not often met with, but is found in the specimens here considered.

Tabanus gilanus Townsend. Whole body dark colored. Abdomen with a median longitudinal row of small gray triangles and on either side a row of oblique spots of the same color; otherwise black with very narrow gray posterior borders to the segments. The red on the sides of the abdomen found in so many species is lacking. Wings hyaline without stump on the anterior branch of the third vein. First two segments of the antennæ and base of third red, remainder black. Basal part of third antennal segment at widest point about as wide as the length of this part. In the United States National Museum are some specimens which have been compared with the type by Mr. Coquillett. Length 13 to 15 millimeters.

Tabanus hyalinipennis Hine. The eyes are naked. It has the aspect of trimaculatus but is smaller, wings hyaline without dark margins to the cross-veins, and with white triangular spots on the third and fourth abdominal segments. Length 15 millimeters. Specimens from Oak Creek Canyon, Arizona, taken by J. T. Lloyd and Dr. F. H. Snow.

Tabanus illotus Osten Sacken. The wings in this species may be said to be subhyaline, especially on the anterior part. Faint clouds on the cross-veins and furcation of the third vein. Antennæ with the third segment rather broad and reddish at the base. Basal annulus almost as broad as long, distinctly excised and with a well marked upper angle; apical portion black and distinctly shorter than the basal annulus. Legs black, somewhat lighter at bases of all the tibia. Length 12 to 14 millimeters. A northern species taken in Alaska and the Hudson Bay region.

Tabanus insuetus Osten Sacken. This appears to be a variable species. The size of the head and width of the front are variable; some specimens have a long stump on the anterior branch of the third vein, while in others there is no vestige of it. Other parts are variable and it would seem that more than one species is included under the name, but constant characters for separation appear to be lacking. As it now stands *insuetus* is separated from all western species by the presence of a single narrow brown stripe across the eye. This shows almost as well in dry as in living specimens. Length about 12 millimeters. Known from Alaska, British Columbia, Washington, Wyoming, Colorado, California, Nevada and Utah.

Tabanus intensivus Townsend. When Townsend described this species he compared it with *gilanus* which appears to be its nearest relative. The general color of the whole body is black clothed with gray pile. The abdomen has a median row of triangles, on each side of which is a row of oblique spots; wings hyaline with no stump on anterior branch of third vein. The antennæ are usually black but the first and second segments and even the base of the third may be obscure reddish. The third seg-

ment is rather narrow, basal part quite long, upper angle slightly prominent, annulate portion decidedly shorter than the basal portion. The form of the third antennal segment is sufficient to separate it from *gilanus*. The male is like the female in coloration. Length 14 to 15 millimeters. Reported from Colorado and New Mexico.

***Tabanus laticeps* n. sp.** Female: Length 12 to 14 millimeters. Head distinctly wider than the thorax, eyes pilose; antennæ with first two segments and base of third red, remainder black; first segment rather large with upper anterior angle narrowly black, third segment rather long and narrow, basal prominence distinct, basal part slightly longer than annulate, front rather wide sides nearly parallel, frontal callosity dark brown, shining, narrowly connected with a prominent denuded spot above, ocellar area large, whole front thinly covered with gray pollen, and upper part with some dark hairs which are most numerous at the apex; face clothed with white hairs, palpi very light colored, with short white hairs. Thorax dark with about five narrow gray lines above, antalar callosity red, sides and sternum clothed with gray hairs; legs with all femora, tips of anterior tibiæ and nearly all the tarsal segments dark brown or black, otherwise red; wings hyaline with stigma and veins clear brown, no stump on the anterior branch of the third vein. General color of the dorsum of the abdomen black, gray as follows: a row of small dorsal triangles and on each side a row of prominent oblique spots with their bases on the posterior margins of the segments. In some of the specimens the black is largely replaced by red and in all the ground color beneath the lateral spots is red; venter of abdomen red with apex dark, or in some of the darker specimens a rather wide median fuscous band extends from base to apex.

Male: Length 12 to 14 millimeters. Like the female except the gray spots on the abdomen are smaller thus increasing the extent of the black.

Specimens collected by Mr. D. W. Coquillett and Sarah E. Harris, and others sent in by Professors V. L. Kellogg and Charles W. Johnson without collector's name.

Habitat, California and Washington. The wide head is characteristic of the species.

***Tabanus laticornis* n. sp.** Female: Length 14 to 16 millimeters. Eyes pilose, antennæ red with the exception of the annulate portion and sometimes the apex of the basal portion of the third segment, which are black; first and second segments with rather coarse short black hairs above; basal portion of the third segment as wide as long, above abruptly widened to basal third and gradually narrowed to beginning of the annulate portion, below gradually curved. Front very gradually narrowed anteriorly, frontal callosity nearly square, scarcely as wide as the

front, shining brown, with spindle shaped spot above; otherwise whole front including ocellar area and subcallus, covered with grayish yellow pollen. Face and cheeks covered with gray pollen and rather long white hairs; palpi white clothed with short white and black hairs mixed. A noticeable thing is that the hairs on the palpi in a number of species appear black from certain views while from other views the same hairs appear white. This seems to be the case here. Thorax black above thinly covered with gray pollen and with the usual gray stripes; sides and sternum with rather long white hairs. Legs in general red, anterior femora and tarsi and apex of tibiae, basal half or more of middle and posterior femora and three or four distal segments of middle and posterior tarsi fuscous or black. Wings hyaline, stigma yellowish, also costal cell and narrow margins of some of the cross-veins dilute yellowish. Abdomen with a rather narrow dorsal black stripe on which is a row of small elongate gray triangles; lateral rows of spots large and red, largest on second segment and decreasing toward apex of abdomen; a fuscous patch on each segment outside of the rows of red spots. Venter red with apex and a midventral stripe, abbreviated in some specimens, black.

Male: Length 14 to 15 millimeters. Colored like the female, abdomen decidedly attenuated posteriorly. Third antennal segment not so wide as in the female.

Several specimens from Arizona and northern Mexico, those from the latter locality collected by C. H. Tyler Townsend.

Tabanus lineola Fabricius. This well known eastern species extends as far west as Utah and Colorado. The naked eyes are sufficient to separate it from the western species resembling it. Length 13 to 15 millimeters.

Tabanus opacus Coquillett. The female type of this species is dark colored with gray stripes on the thorax and three rows of gray spots on the abdomen. Wings hyaline with brown stigma, and a long stump on the anterior branch of third vein. Antennae black with the first segment partially reddish; subcallus not denuded, legs black with basal half of front tibiae and nearly all of the other tibiae reddish. On the second and third segments of the abdomen the ground color beneath the lateral gray spots is reddish and there is also a suggestion of reddish on the sides of the second segment, but the latter is so small that it is hardly worth mentioning.

The male is colored like the female except the reddish on the sides of the first two abdominal segments is slightly more extended and there is a trace of reddish at the base of the third antennal segment. The stump of the anterior branch of the third vein is only suggested in this sex.

A number of specimens before me agreeing with the female type were collected in southern Idaho, Logan, Utah, by E. D.

Ball, and near Lander, Wyoming, by R. C. Moodie of Lawrence, Kansas. Some slight color variations occur, and in many specimens the antennæ are entirely black. The long stump is present on the anterior branch of the third vein in all the females.

Tabanus osburni n. sp. Female: Length 12 to 16 millimeters. General color of the body shining black. Eyes pilose, first and second segments of the antennæ black or they may be partly reddish, clothed with black hairs, third segment black except the base which is red, basal portion with a blunt prominence above, longer than the annulate portion. Subcallus denuded and shining black, frontal callosity shining black with unconnected mark above; ocellar area partly denuded black, remainder of front covered with gray pollen; face and cheeks clothed with gray pollen and dark yellowish hairs, palpi yellowish with short black hairs; thorax with inconspicuous narrow gray stripes above; pleuræ clothed with long gray pile. Legs black but bases of tibiæ showing a reddish tinge. Wings hyaline but with costal margin and narrow margins of cross-veins and furcation of third vein fuscous; these infuscations on the margins of the veins are less conspicuous in some specimens than in others. Abdomen black with three rows of faint gray spots above and the posterior margin of each segment both above and beneath with a fringe of rather long white hairs.

Male: Length 12 millimeters. Like the female except the grayish spots on the dorsum of the abdomen appear to be lacking, and the third segment of the antennæ is noticeably narrower than in that sex. This latter character is characteristic of this sex in a large number of species. The head is larger and nearer hemispherical than in the female.

A large number of specimens, most of them taken by Prof. R. C. Osburn, for whom the species is named. Known from British Columbia, Alberta, Montana, Washington and Alaska.

This species is some like *rhombicus* but more robust and no suggestion of red on the abdomen of either sex.

Tabanus phænops Osten Sacken. The antennæ are black, the wings are hyaline and the abdomen is broadly red on the side. Length 13 to 14 millimeters. Distributed from Alaska and British Columbia to California, and specimens are also at hand from Wyoming and Colorado. Osten Sacken fully described this species in his paper on "Western Diptera" and his description should be consulted.

Tabanus procyon Osten Sacken. The palpi, legs and antennæ, as well as the whole body, are black; the subcallus is denuded and shining black, the wings are hyaline except the costal cell, margins of cross-veins and furcation of third vein which are black. Length 13 millimeters. Known from California, and specimens are at hand from Eldorado collected by Sarah E. Harris.

The black palpi is a character it shares with sequax but the denuded subcallus and the black unspotted abdomen easily distinguish it. The costal cell is also much blacker than in the last named species.

Tabanus productus n. sp. Female: Length 11 millimeters. Antennæ black, first segment rather long and narrow, third not much excised above and with a small basal prominence; frontal callosity square, black and as wide as the front with unconnected square black spot above it; front rather wide slightly narrowed anteriorly and clothed with gray pollen; face and cheeks covered with gray pollen and white pile, palpi white with white hairs and also some that look black from certain views; eyes naked. Thorax dark with narrow gray stripes above and white pile on the sides and beneath; legs black except about one-third of front tibiæ and more than half of the other tibiæ which are white; wings hyaline with clear brown stigma and veins and with a long oblique stump at the base of the anterior branch of the third vein. This stump has a direction which is nearly parallel with the last section of the posterior branch of third vein. Abdomen dark with a middorsal gray stripe and on each side a series of somewhat oblique spots joining one another end to end, thus forming a stripe with the outer border serrate; posterior margins of the segments both above and beneath narrowly whitish.

Male: Length 11 millimeters. Colored in detail like the other sex; line of separation of large and small facets of the eye distinct.

Specimens taken near Lander, Wyoming, at an elevation of from 5000 to 7000 feet the past summer by R. C. Moodie of Lawrence, Kansas.

This species looks some like lineola but is smaller, the legs and antennæ are darker and the distinctive stump on the anterior branch of the third vein differs from what I have observed in that species.

Tabanus punctifer Osten Sacken. Distributed over a great deal of the western country, especially from Colorado to California and southward. The general black color of the body except the thorax, which is covered with white pile and the white base of the anterior tibiæ, makes it the easiest western species to distinguish. Length 19 to 22 millimeters.

Tabanus rhombicus Osten Sacken. Osten Sacken described this species in his "Prodrome" and later in his "Western Diptera" gave additional notes upon it. At the time of the latter writing, he had better material than when he first wrote, and from this material he characterized three forms, as he called them, which when arranged in series appear quite distinct from one another; and present characters by which in good specimens they can be separated readily.

T. rhombicus has been misdetermined by many and consequently exists under various names in American collections. The specimens used in this study of the species were compared with Osten Sacken's types and there are before me a long series of specimens agreeing with each of the three forms. Dr. John Marten has described some species of *Tabanus* in Vol. 14 and 15 of the Canadian Entomologist, which seem to correspond with these forms, and after collecting all available information and studying Marten's descriptions carefully, it appears to me that *centron* is the same as Osten Sacken's second form of *rhombicus*, and as the latter author did not propose any name, Marten's name remains valid.

Tabanus rhombicus has the subcallus denuded and no stump on the anterior branch of the third vein. General color of the whole body dark with only a trace of red on the sides of the second and third abdominal segments and three rows of gray pollinose spots. Wings hyaline with traces of fuscous on the borders of the cross-veins and at the furcation of the third vein. Length 13 to 15 millimeters. Specimens from Albany Co., Wyoming, collected by E. B. Williamson; from Estes and Manitou Parks Colorado, collected by Dr. F. H. Snow, and from southwestern Colorado, collected by E. J. Oslar.

Theriopectes (?) *melanorhinus* Bigot seems to be this species, judging from the re-description of Bigot's type Miss G. Ricardo has been so kind as to send me.

Tabanus septentrionalis Loew. This species is somewhat variable in size and coloration but does not appear to be a difficult one to recognize. The subcallus is not denuded; the gray triangles in the middle of the abdominal segments are united to form what may be called a dorsal stripe and on either side of this a prominent row of spots extends from the first to the sixth segment, one spot to each segment. The ground color beneath these spots is often, but not always red. The wings have a dilute yellowish tinge all over and the veins are brown but there is no distinct fuscous margins to the cross-veins or at the furcation of the third vein. Length 13 to 17 millimeters.

Tabanus sequax Williston. The palpi are black, costal cells hyaline, and the stigma and margins of the cross veins and furcation of the third vein are also black. On account of the black palpi the species can only be confused with *procyon*, and the other characters mentioned will separate it from that. Length 13 to 16 millimeters.

Thinking that Bigot's *leucophorus* was this species, I sent specimens to Miss G. Ricardo who compared with the type and verified my determination. In her letter she makes the following statement: "The specimen sent on comparison with the type is certainly identical; the type is a trifle larger and the dark hairs

at the sides of the antennæ are not so black or so thick as in your specimen, and the forehead is not so dark."

The specimen I sent Miss Ricardo measures fully 16 millimeters in length. As Bigot gives the length of his type as 11 millimeters, we see how misleading his statements may be.

Tabanus sonomensis Osten Sacken. The antennæ are black or they may be dark red at base, the third segment is narrow with the basal portion longer than the annulate portion, and the basal prominence is small; the palpi are brownish yellow clothed with black hairs, the sides of the front in the female are nearly parallel, the abdomen is plainly red on the sides. The usual dorsal row of gray triangles may be seen in well preserved specimens but no lateral rows are apparent. The red on the sides of the abdomen is somewhat variable in extent, and the posterior margins of the segments are furnished with a fringe of yellow hairs. The wings are hyaline but many of the veins, especially the cross-veins and furcation of the third vein, are margined with fuscous.

The species is separated from *rhombicus* and its allies by the nearly complete absence of lateral gray spots on the abdominal segments; and from *affinis* by the narrower third antennal segment, as well as its smaller average size, from *epistatus* by the blacker antennæ, and from *phænops* by its larger average size and clouding of the cross-veins and furcation of the third vein.

The several males I have are colored like the females and easily associated with them, although the fringes of hairs on the posterior margins of the abdominal segments are not so conspicuous in this sex. Length 13 to 18 millimeters.

I consider *hæmaphorus* Marten a synonym of *sonomensis*.

Tabanus susurrus Marten. The antennæ are red with the annulate portion of the third segment black; the wings are hyaline but there are faint clouds on the margins of the cross-veins and at the furcation of the third vein. All the femora, the apex of each anterior tibia, and the anterior tarsi are black or dark brown, other parts of legs red, except darker coloration on some of the tarsal segments. The abdomen is red on the sides of the first three or four segments. Specimens from Wyoming collected by Morrison. Marten's type was from Montana. Length 13 millimeters.

Tabanus venustus Osten Sacken. This species is known from all others of its genus by the large irregular dark patches on the wings. Eyes naked. Length 14 to 16 millimeters. Taken as far west as Oklahoma.

Tabanus zonalis Kirby. This distinct species has the wings uniformly tinged with yellowish and the abdominal segments are black anteriorly and broadly yellowish posteriorly. The antennæ are red but the apex of the third segment may be black, palpi

brown, all the femora, apex of tibiæ and anterior tarsi, black, remainder of legs red. Length 17 millimeters. Specimens from Mission Mountains, Montana, received from Prof. M. J. Elrod, and from Laggan, Alberta, collected by Prof. R. C. Osburn. Widely distributed in northern United States and Canada.

SPECIES NOT IDENTIFIED.

Tabanus tetricus Marten. This is colored something like rhombicus but with red antennæ. Described in Canadian Entomologist XV, 111.

Tabanus fuscipalpis Bigot. This description suggests *T. sequax*. Blackish palpi are not found in many species of its group. Mem. Soc. Zool. France V, 681.

Tabanus hirtulus Bigot. I do not recognize this species. It seems to be colored much like some of the darker specimens of *sonomensis*. The antennæ are black with a trace of red at the base of the third segment, the subcallus is not denuded and the anterior branch of the third vein bears a long stump. Mem. Soc. Zool. Fr. V, 641.

Tabanus maculifer Bigot. Agrees in many respects with *phænops* but has the subcallus denuded. I have never seen a specimen of *phænops* with this character. Mem. Soc. Zool. Fr. V, 641.

Tabanus villosulus Bigot. Must resemble the male of *Apatolestes comastes* Will. Mem. Soc. Zool. Fr. V, 684.

Diachlorus notatus Bigot. Suggests *Silvius pollinosus* and *quadrivittatus*. There are some specimens of these species with wings such as Bigot describes. Mem. Soc. Zool. Fr. V, 623.

LIST, SYNONYMY AND BIBLIOGRAPHY OF SPECIES TREATED IN THIS PAPER PANGONIA.

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hera Osten Sacken, West. Dipt. 214. From San Francisco, California.
incisa Wiedemann, Auss. zweifl. Ins. I, 90. From Ark. Col. N. M., Oklahoma.
incisuralis Say, Jr. Ac. Nat. Sci. III, 31; Compl. Writ. I, 75.
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saussurei Bellardi, Sag. Ditt. Mes. I, 49. From southern Arizona and Mexico.
velutina Bigot, Mem. Soc. Zool. Fr. V. 615. From California.

CHRYSOPTERUS.

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niger Walker (not Macq), List I, 202.
provocans Walker, Dipt. Saund. I, 73.
 (?) *atra* Macquart, Dipt. Exot., Suppl. 4, 40.
jugax Osten Sacken, Prodrôme I, 375. Williston Tr. Ks. Acad. Sci. X, 132.
ceras Townsend, Psyche VIII, 38. From New Mexico and northern Mexico.
coloradensis Bigot (in part), Mem. Soc. Zool. Fr. V, 605. Ricardo, Ann. Mag. Nat. Hist., Ser. 7, VIII, 307. From Col., Cal., and Washington.
coquillettii Hine. Described in this paper. From Colorado.
discaelis Williston, Tr. Conn. Acad. IV, 245. From Wyo., Col., Mont. and Utah.
excitans Walker, Dipt. Saund. 72. Osten Sacken, Prodrôme I, 373. From Me., N. H., Pa., Wash., B. C., Ills., Mass.
facialis Townsend, Psyche VIII, 39. From N. M. and Ariz.
frigidus Osten Sacken, Prodrôme I, 384. Prodrôme II, 474. Hine, Taban. Ohio 37. From N. H., N. Y., Mass., N. J., Ohio, Wash., British Possessions.
fulvaster Osten Sacken, West. Dipt. 221. Ricardo, An. Mag. Nat. Hist., Ser. 7, VIII, 306. From Col., Utah, Wyo., Ariz., N. M., Mont.
coloradensis Bigot (in part) Mem. Soc. Zool. Fr. V, 605.
furcatus Walker, List I, 199. Osten Sacken Prodrôme I, 391. Ricardo, An. Mag. Nat. Hist. Ser. 7, VIII, 302. From N. Y., Montreal, Canada.
lupus Whitney, Can. Ent. XXXVI, 205. From Colorado.
mitis Osten Sacken Prodrôme I, 374. From Mont., Wash., Montreal, Canada.
nigripes Zetterstedt, Ins. Lap. I, 519. Loew, Vehr. Zool. Bot. Ges. VIII, 623. Osten Sacken, Prodrôme I, 394. Coquillett, Wash. Acad. Sci. II, 406. From Europe, Lapland and Alaska.
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pertinax Williston, Tr. Ks. Acad. Sci. X, 132. Ricardo, An. Mag. Nat. Hist., Ser. 7, VIII, 307.
nigriventris Bigot, Mem. Soc. Zool. Fr. V, 604.
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proclivis Osten Sacken, West. Dipt. 222. Ricardo, An. Mag. Nat. Hist. Ser. 7, VIII, 306. From California and Washington.
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pachycera Williston (male only) Tr. Ks. Ac. Sc. X, 134. Adams, Ks. Un. Sc. Bull. II, 442.
sequax Williston, Tr. Ks. Ac. Sci. X, 133. From Ks. and N. C.
surdus Osten Sacken, West. Dipt. 223. Williston, Tr. Ks. Ac. Sci. X, 134. From Cal., Or. B. C.
virgulatus Bellardi, Saggio Ditt. Mes. I, 71, tab. 2. fig. 17. Williston, Biol. Cent. Am. I, 255. From Mexico.
geminatus Macquart (not Wiedemann), Dipt. Exot. Suppl. IV, 39.
crassicornis v. d. Wulp, Wien. Ent. Zeit. III, 141.

SILVIUS.

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trifolium Osten Sacken. Prodrôme I, 395.

pollinosus Williston, Tr. Conn. Ac. IV, 244. Tr. Ks. Ac. Sc. X, 131. From Ks., Col.
quadrivittatus Say, Jr. Ac. Nat. Sci. Phil. III, 33. Compl. Writ. II, 54. Wiedemann, Auss. Zweifl. Ins. I, 200. Osten Sacken, Catalogue of 1878, 226. Williston Tr. Ks. Ac. Sc. X, 131. From Cal., Neb., N. Mex., Texas.

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HÆMATOPOTA.

americana Osten Sacken. Prodrôme I, 395. From Dak., Mont., Col., B. Col., Cal.

SNOWIELLUS n. gen.

atratus Hine, Described in this paper. From Arizona.

TABANUS.

ægrotus Osten Sacken, West. Dipt. 219. From Cal., Wash., and B. C.
affinis Kirby, Faun. Bor. Am. IV, 313. Osten Sacken, Prodrôme II, 466. Kirby's description is republished in Can. Ent. XIII, 166. From northern U. S. and Canada from the Atlantic to the Pacific.

triligatus Walker, List V, 183.

annulatus Say, Jr. Ac. Nat. Sci. Phil. III, 32. Compl. Writ. II, 53. Osten Sacken, Prodrôme Supl. 555. From Mo., Ky., Ga., Ks., La.

atratus Fabricius, Syst. Ent. 789. Ent. Syst. IV, 366. Bellardi, Saggio Dit. Mess. I, 58. Osten Sacken, Prodrôme II, 454. From eastern U. S. as far west as Colorado.

niger Palisot de Beauvois, Ins. Dipt. 54, tab. I, fig. 1.

americanus Drury, Ins. I, tab. 44, fig. 3.

validus Wiedemann, Auss. zwei. Ins. I, 113.

benedictus Whitney, Can. Ent. XXXVI, 206.

captonis Marten, Can. Ent. XIV, 211. From Cal., Wash., Or., Br. Col.

comastes Williston, Tr. Ks. Ac. Sci. X, 137. Townsend, Tr. Am. Ent. Soc. XXII, 58.

centron Marten, Can. Ent. XIV, 211. From Col. and Wyo.

coffeatus Macquart, Dipt. Exot. Supl. 2, 23. Osten Sacken, Prodrôme II, 441. From D. C., Del., N. Y., Fla., Mass., Ind., N. J., Col.

(?) *nigripes* Wiedemann, Dipt. exot. 1, 75; Auss. zwei. Ins. I, 142.

cribellum Osten Sacken, Biol. Cent. Amer. I, 52. From Mexico and New Mexico.

guttatulus Townsend, Tr. Ks. Ac. Sci. XIII, 134. Psyche VIII, 147.

dodgei Whitney, Can. Ent. XI, 37. From Ks. and Neb.

epistatus Osten Sacken, Prodrôme Supl. 555. Hine, Tabanidae of Ohio, 50. From N. J., Can., Col., Ohio.

socius Osten Sacken, Prodrôme II, 467.

californicus Marten, Can. Ent. XIV, 210.

flavidus Hine, Described in this paper. From Ariz. and Mex.

fratellus Williston, Tr. Ks. Ac. Sc. X, 140. From Wash., Br. Col.

hæmatopotides Bigot, (Diachlorus?) Mem. Soc. Zool. Fr. V, 624.

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gilanus Townsend, Psyche VIII, 92. From N. Mex.

hyalinipennis Hine, Can. Ent. XXXV, 244. From Oak Creek Canyon, Ariz.

illotus Osten Sacken, Prodrôme II, 469. From Alaska and northern North America.

- insuetus Osten Sacken, West. Dipt. 219. From Cal., Wash., Col., Nev., Alaska.
- intensivus Townsend, Psyche VIII, 93. From N. Mex., Col.
- laticeps Hine, Described in this paper. From Cal. and Washington.
- laticornis Hine, Described in this paper. From Ariz. and Mex.
- lineola Fabricius, Ent. Syst. IV, 369. Syst. Antl. 102. Osten Sacken, Prodrôme II, 448. Biol. Cent. Am. I, 56. From eastern N. A. west to Col. and Utah.
- (?) *scutellaris* Walker, Dipt. Saund. 27.
- simulans* Walker, List I, 182.
- trilineatus* (Latr.?) Bellardi, Saggio Ditt. Mess. I, 63.
- opacus Coquillett, Invert. Pacifica I, 21. From Nev., Utah, Wyo.
- osburni Hine, Described in this paper. From B. C., Alaska, Mont., Wash.
- phanops Osten Sacken, West. Dipt. 217. From Cal., Col., Wash., B. C., Alaska.
- procyon Osten Sacken, West. Dipt. 216. From Cal.
- productus Hine, Described in this paper. From Wyoming and Utah.
- punctifer Osten Sacken, Prodrôme II, 453. West. Dipt. 220. From western N. A. as far north as San Francisco.
- reinwardtii Wiedmann, Auss. zweifl. Ins. I, 130. Osten Sacken, Prodrôme II, 461. From eastern N. A. as far west as Colorado.
- erythroletus* Walker, Dipt. Saund. 25, tab. 2, fig. 1.
- rhombicus Osten Sacken, Prodrôme II, 472. West. Dipt. 218, From Col., Wyo., Or. Wash., Mont.
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- tarandi* Walker, List I, 156.
- terræ-novæ* Macquart, Dipt. Exot. Suppl. 4, 35.